VOLUME XXXIII NUMBER 3 WHOLE NUMBER 282

THE JOURNAL
OF
THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

DEVOTED TO THE ADVANCEMENT OF ASTRONOMY AND ALLIED SCIENCES

EDITOR, C. A. CHANT ASSISTANT EDITOR, F. S. HOGG
David Dunlap Observatory
Richmond Hill P.O., Ont.

ASSOCIATE EDITORS
R. MELDRUM STEWART
Dominion Astronomer
Ottawa

W. E. HARPER
Director of the Dominion Astrophysical Observatory
Victoria, B.C.

J. PATTERSON
Controller of the Meteorological Service of Canada, Toronto

PUBLISHED MONTHLY
(*Ten numbers per year*)

March, 1939

PRINTED FOR THE SOCIETY
TORONTO: 198 COLLEGE ST.

THE JOURNAL
OF
THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

VOL. XXXIII, No. 3 MARCH, 1939 WHOLE No. 282

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	4 pp.	8 pp.	12 pp.	16 pp.	20 pp.	24 pp.
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Covers, extra, 50 copies, $1.50; 100 copies, $2.00; 200 copies, $2.50.

Business correspondence, remittances, etc., should be addressed to J. H. Horning, Treasurer of the Society, 198 College Street, Toronto.

Communications regarding Library matters should be addressed to the Librarian.

$2.00 per annum. Single numbers, 25 cents.

Subscription to the JOURNAL is included in membership fee.

PRINTED IN CANADA

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Vol. XXXIII, No. 3 MARCH, 1939 WHOLE No. 282

MATHEMATICS AND ASTRONOMY

By WILLIAM FINDLAY*

MR. Chairman, fellow members and friends of the Royal Astronomical Society, I appreciate most highly the honour conferred upon me in being permitted to appear before you on this occasion and in this capacity. I am truly ashamed of the carelessness, or was it the thoughtless audacity that permitted me to drift into this situation. Unfortunately you must share with me in the consequences. Let us make the best we can of our present embarrassment.

At the outset, may I take advantage of this opportunity to emphasize the value of the efforts of the amateur astronomer. By amateur we mean one whose chief occupation, whose vocation is along some other line, but who finds in astronomy an interesting hobby, and who with some degree of activity and some success of achievement pursues this science as an avocation. He merits the term astronomer to the extent in which he has acquired some understanding of the science and also in so far as he is at work seeking to extend his own knowledge and to apply that which he has already obtained to gain more and new knowledge: one who is alert to see and to understand. We would emphasize the value of the work of the man, who with limited instrumental equipment and with limited time at his disposal, but equipped with patience and intelligence and skill to make use of the tools he has, who is delighted to strive on to observe and to understand the phenomena accessible to him.

*Address of the President of the Royal Astronomical Society of Canada at the Annual At-Home of the Society held in the McLennan Laboratory, University of Toronto, Tuesday, January 24, 1939.

This Royal Astronomical Society of Canada, with its large membership and its active branches in so many important centres of our Dominion, is largely a society for the amateurs who form so great a part of its membership. Certainly one function of the Society is to promote the interest and stimulate the activity of these non-professional members, to give opportunities for the expression of their interest in a more or less public way and to promote by literature and by public meetings, an intelligent interest in and knowledge of astronomical matters among our Canadian people generally. Who can measure how much this Society has done for Canada by inspiring and assisting such men (to mention only some who have passed on) as Andrew Elvins, A. D. Watson, John A. Patterson, D. B. Marsh, and David Dunlap? How many have been themselves greatly helped as they prepared papers for our regular meetings of Centres, or as they assisted the curious throng at a field night, explaining to the novice as he gazes for the first time it may be, through a telescope, the significance of what is seen. A short time ago, in our small Centre in Hamilton, we held an exhibition of instruments and other objects made by the members and it was a very pleasant surprise to find what a wealth of ingenuity and achievement was displayed. It has been stated that the members of the Centre at Victoria, B.C., are constructing their own telescopes at the rate of about six instruments each year.

Fruitful results obtained by amateur astronomers are noteworthy particularly in the fields of meteor observation and the study of variable stars. In the first of these, since each meteor is visible over but a small fraction of the earth's surface, and since several observations, from separated stations are required to determine the meteor's exact location, it is imperative that an extensive co-operation of scattered observers be obtained. Our Librarian, Dr. Millman, has recorded from time to time the co-operation given by our members and others in meteor observation. In the October JOURNAL, for example, is a stimulating account of results obtained by a group of observers in Italy.

In the study of variable stars, there is a good opportunity for the amateur. Professor Russell in the June number of the *Scientific American* discusses in some detail the productive work of an amateur

astronomer, equipped with but a small telescope, with no driving clock, no photometer and an unfavourable climate, who by careful and patient analysis of many observations was able to explain what seemed to be an irregular type of variable. In the same article he commends the excellent work and significant results obtained by two Russian amateurs.

There is an abundant supply of printed material available to help any who may wish to share in these or other lines of co-operative work. The officers of the Society will be very glad to assist any who may wish to secure such.

The year 1938 contained the two hundredth anniversary of the birth of Sir William Herschel, whom we may cite as a great and successful amateur astronomer. At the age of twenty he escaped from the hard home conditions of his boyhood and youth and migrating to the English kingdom of his sovereign, entered on his career as a professional musician. Another twenty years of hard work and many privations brought him success in this field and he attained some eminence as an organist, a concert master and a hard working music teacher. During the latter part of this period he developed a great interest in astronomy and became a painstaking and thoughtful observer and also particularly interested in an ambition to construct a telescope of greater power than any then available. In this he succeeded after many failures and partial successes. Soon after his fortieth year he attracted the attention of a Dr. Watson, a member of the Royal Society and on the latter's invitation began to contribute papers to the Proceedings of that Society. His crowning early success was the discovery of the first new major planet, known to-day as Uranus. King George honoured this successful amateur, now famous, by inviting him to become his private astronomer and from that time he ceased to be a successful musician with astronomy as a hobby and became a professional astronomer with telescope making as a lucrative side line.

In the life of this great man may we not find a stimulus and a challenge to each of us to have a worthy hobby and to make a success of it by enthusiastic activity. We may not many of us find as great an opportunity as did Herschel, but we can have something of the

same devotion and we may share with him in the joy of enthusiastic endeavour and of whatever achievement we may be able to make.

Perhaps also we may trace some similarity in Herschel's effort and accomplishment to the life of our Society. He did three great things. He placed at the disposal of men of his day better instruments than they had known. Thereby he greatly increased public interest in the beauties and wonders of the heavens. By his patient and efficient searching he discovered many new things. May we not make a somewhat similar claim for our Society? In the observatories at Richmond Hill, at Victoria and at Ottawa we have instruments which have greatly extended our powers of observation and in the promotion of which we may claim some share. This Society has done much to arouse the interest and activity of many of our Canadian people in matters astronomical. The patient and efficient activity of members professional and amateur has added to man's knowledge of the universe.

Like Herschel we have been fortunate in securing royal recognition and we are greatly indebted to the annual royal bounty which has enabled this Society to carry on the important programme of publication and promotion which year by year has been our honourable contribution to the progress of astronomy. Like Herschel, let us press on with an ever-enlarging vision and with an ever-unslaking effort.

In an excellent historical paper printed in a recent number of the JOURNAL, Dr. Harper pointed out that 1939 marks the hundredth anniversary of the erection of the first observatory in Canada on a site quite close to our present place of meeting. Also we are near to the fiftieth anniversary of the definite organization of this Royal Astronomical Society. It may be not out of place to suggest that some recognition might be made of these anniversaries.

From these rambling remarks about present day affairs in the realm of astronomy, by one whose chief interest has been in the companion realm of mathematics, let us turn our thought to the historical interrelations of these two sciences, Astronomy and Mathematics, both boasting long centuries of active service in the practical and in the intellectual life of mankind.

The birth of each antedates our earliest knowledge of human

thought. Our oldest records reveal them as lusty youths, that have already proved their worth and accomplished much in the world. One wonders if there ever was a time when they were mere children dreaming shadowy dreams and learning the use of arms and legs. Like our first parents they seem to have been made for each other, rising in some inexplicable way, with already well developed powers, out of the dust of a new world of human passions and impulses, hitherto devoid of organized forms of intellectual effort. Perhaps they might be called the First Parents of our intellectual race, who in some Eden epoch came to know each other and to learn the meaning of the new world which they were created to occupy and rule. The charter of their united life was "Be fruitful and multiply and replenish the earth and subdue it; and have dominion over the fish of the sea and over the fowl of the air and over every living thing that moveth upon the earth". No depths of philosophy, no aerial heights of poetic fancy, no active and practical form of scientific thought is outside the influence and sphere of their helpful and controlling endeavours. They have shared the common lot that only by the sweat of heavy labour is life's task to be accomplished.

If we know not of their childhood, we have some knowledge of their youth. Fair Astronomy peopled the skies of her childhood with heroes and heroines, with eagles and dragons. The wandering stars were her gods and goddesses. Her faithful spouse learned from her the beauties of orderliness and constancy. In her, he found the realm of the perfect. His thoughts were preoccupied with the ideals of his dreams, with the mysticisms of his pure numbers, with the logical rigours of his geometrical visions so far removed from the world of the senses. To his love he gave a maze of spheres within spheres, of deferents and epicycles as ornaments and garments for her beauty. In their early youth these two seem to have played together in the temple kindergartens of Babylon. Forms of expression there acquired remain even to the present day. But in the rambles and enterprises of their later Grecian youth they gathered insight and ideals, they constructed standards of rational judgment which have determined greatly all subsequent achievements. They attained the conception of a geometrical model which would co-ordinate the facts of observation, would give a clear picture to the imagination and serve as a

means of predicting the future. They perceived that reality may differ from the first impression given by the senses and that opposing alternatives must be decided upon by a careful weighing of all factors to be co-ordinated and explained. They acquired freedom in the use of the imagination and in the continued alteration and development of fundamental concepts to make them consistent with increasing knowledge of the phenomena.

Three children were born to this happy couple during these fruitful years, the first the form of geometry known to us by the name of Euclid, the masterly deductive arrangement of the science of the ideal concepts of point, plane, straight line and circle that has ever since held a leading role in our thought world. The second appeared as a section in a text-book on astronomy. Beginning as spherical trigonometry it has grown into a large and useful member of the family. The third is the crowning achievement of the period, the Ptolemaic System of mathematical astronomy. Possibly some might maintain that the lusty youths of logic and Aristotelian natural philosophy should be included. One must admit that mathematics had other mighty sons: the conic sections of Minaechmus which Kepler called in two thousand years later to occupy a leading part in the new structure of mathematical astronomy; the beginnings of mechanics which achieved such power in Archimedes over two hundred years before our era began and which nearly two milleniums later also became an active partner in the field of astronomy.

But the blighting influence of militaristic Rome, followed by the barbaric hordes from the north and the Moslem floods from the south and east, eclipsed the civilization of the Greek era. Mathematics became a slave in the Mahometan household, and fair astronomy a member and ornament of its harem. Both learned much through the opportunities afforded of contact with the thought of the far east. Mathematics acquired a much better system of numeration, the so-called Arabic numerals. The subject of algebra bears an Arabic name. Astronomy in her present vocabulary shows repeatedly how intimate were her relations with her Moorish lovers.

Ultimately, the merchants of Italy and the universities of Spain made possible the return of the exiles to a new western world. The revival of learning, following the recapture of Constantinople made a

favourable opportunity for their re-entrance. The new Universities of Europe sheltered scholars that dared to enquire, to open up forgotten stores of learning, to seek new knowledge. Arithmetic awoke in Italy. Geometry escaped from Spain. Trigonometry was reborn in Germany. Through the brilliant work of a young Polish student, Nicholas Koppernick, a new child was born to the reunited lovers, the so-called Copernican system of mathematical astronomy.

But the new path was not all roses. The hoary and non-productive Aristotelian system, enshrined in the Church schools of Rome, bitterly opposed all new ideas and even the revival of old ones. What Koppernick did was to recover the ancient heliocentric concept and give it a beautifully executed new mathematical dress. All celestial motions still remained circular. There was no principle of cause and effect. The elaborate, difficult and only partially successful system of epicycles and deferents was replaced by a much simpler structure.

Galileo, upon whom fell the heavy hand of angry criticism, helped on the new child. He startled the world by enthroning observation as the true source of knowledge. He introduced the telescope and recreated a new science, that of Dynamics.

An ideal love scene was staged in the far north. Tycho Brahe, a fortunate and gifted astronomer, well provided for financially and socially, aflame with a love for accurate observation, piled up a treasury of carefully measured information concerning the motions of the planets. His pupil Johann Kepler, a capable and indefatigable mathematician, devoted himself to the task of an analysis of the results of his master. After a lifetime of painstaking effort he succeeded in organizing this rich germ plasm about three revolutionary theses arising therefrom, the so-called Kepler's Laws. The orbit of each planet is an ellipse, with the sun at its focus—a complete break with the dominant circle concept that ruled all preceding astronomy. The rate of motion is not constant as hitherto held to be, but obeys the law of equal areas. There is a definite relation between distances and period: the square of the period varies as the cube of the distance.

From these combined efforts of the Astronomer and the Mathematician there appeared in due time the noblest child of our happy family. To Newton is credited the glory of its birth, accomplished in his Principia. A skilled mathematician, the creator of a new tool,

the infinitesmal calculus, he devoted his great ability to the formation of a rational explanation in scientific form, *i.e.* in mathematical language of the new store of astronomical facts. His work was continued and in a sense completed by Laplace. Thus we have mathematics and astronomy consummated in the triumphant science of Celestial Mechanics.

Here our historical outline must cease.

Each of the partners in our Family has gained greatly from the other. Without the organizing skill of Hipparchus and Ptolemy, of Kepler, Newton and Laplace, Astronomy would have been a disconcerting mystery of incomprehensible changes in a bewildering multitude of objects and events. The mathematical theory did much more than organize and synthesize the facts observed. It brought into the field of astronomy whole areas of nature whose relation thereto was not suspected earlier. The appeal of astronomy to human interest has been greatly increased as the reign of Law became known. The rescue from the tyranny of fear and the evil devices of the charlatan meant a dignity and a strength that gives astronomy a first place among the descriptive sciences. Mathematics is the indispensable tool of the modern astronomer. Napier with his logarithms made feasible the computations essential to progress, the complexity of which in his day had become a serious barrier to advance. Gauss, when the astronomers were perplexed how to keep track of the many newly found asteroids, produced a means of determining the path of an object from three observations. Neptune and Pluto were discovered first in the mazes of celestial mechanics and later by the astronomical observer. The modern observer plumbs the depths of space, explores the inner structure of the blazing star and determines variations in the motions of mother Earth, reckons the past and peers into the future, largely with the instruments furnished by the mathematician, largely because he himself is a good mathematician. How varied the demand upon the astronomer of to-day! He must be a good mechanic; he must be a highly trained physicist; he must have the comprehensive and creative imagination of a seer that he may interpret what is seen and blaze out new trails; but above all the astronomer needs to be a practical and indeed also a theoretical mathematician.

On the other hand, mathematics is greatly indebted to his life partner, Astronomy. Her beauty and charm, her challenging appeal to the best that was in him rescued him from the slavery of the counting house, of industry and of human conflict. She made real to his mind the ideal and the logically organized. Her needs have been the driving force of his best endeavours.

The earliest system of fractions still show clearly their astronomical matrix in the division of the degree and of the hour into sixtieths and sixtieths of sixtieths, survivals of the ancient Babylonian fractions. Astronomy has furnished employment for expert computors and has demanded of the mathematician the perfection of aids to this art. No other science has made such demands upon refinement in approximation methods or has furnished numbers so accurately-determined. . . . Let me illustrate. In considering the length of this paper, I attempted to express in astronomical terms just when it would end. The result is expressed in the following terms. I found that the moment when I hoped at least to stop is that given by 2429288.60642 J.D.

Our good chairman might have an electric button beside him wherewith he could easily verify the accuracy of this measure correct to the last of these digits and possibly he might secure another digit of accuracy. Where else will one find thirteen digit numbers entering into scientific measurements? We admit, of course, that equal accuracy is required at both ends of the measuring stick and that this may effect somewhat the illustration.

Astronomy has been the inspiring mistress of many great mathematicians directing their researches. By her ever advancing unsolved problems she has challenged their best endeavours. She has richly rewarded their labours by the joy of conquest in the successful reduction of a multitude of varied phenomena to mathematical formulas adequate for the purpose. Long before other charmers sought his attention, the astronomer-mathematician had the thrill of an organized knowledge of the laws of the recurrence of eclipses and of the varied and intricate motions of the wandering stars.

On the other hand, perhaps still more important, have been the unconquered problems that astronomy has kept in the mathematical arena, such as the intricacies of the motion of the moon and the

general problem of the motions of three bodies. How alluring have been the more recent problems of measuring and accounting for such things as the proper motion of the sun in space and the rotation of our galaxy. The unaccounted-for rate of motion of the perihelion point of Mercury's orbit was a stimulating factor in Einstein's reconstruction of the mathematical basis of our conception of the structure of the universe. Of late the physicist has taxed the mathematician's power to understand the exceeding small: the astronomer has taxed his power to deal with the inconceivably great.

Many of the data of astronomy are spread out before the eyes of all and challenge widespread interest and enquiry. Thus astronomy has served to publicize the triumphs of mathematical thought.

Astronomy and mathematics agree in demanding freedom to explore far beyond the so-called practical, beyond what is seen to be of immediate use in other areas of human interest. Each has supported the other in magnifying the instrinsic interest of well-ordered thinking and they have provoked one another to higher and higher flights of imaginative outreaching and to more rigorous analysis.

In the fierce Cyclopean workshop, where modern ideas are being forged, we find men like Einstein and Jeans handling with skill and daring co-ordinate systems of four and of no dimensions, calculating the unimaginable orbits of excited electrons dancing in the midst of an enormous sun. These heroes bring out from their fiery furnaces world concepts of a beauty and of a far-reaching significance that make them front page news in a world-wide press, topics of discussion in thousands of intelligent circles. Which is the greatest, the mathematical capacity of the worker, the acumen of the physical theory, or the scope and success of the astronomical world-view? Who can say? The mathematical theorist digging up new and almost incomprehensible abstractions, the experimenter counting the hits in an electronic bombardment and the manipulator of a two hundred inch telescope reaching out to measure things that happened millions of years ago at distances quite beyond the ranges of the human imagination, these are co-workers in the great workshop of the human intellect and share jointly in the glories of its great achievements.

McMaster University,
Hamilton, Ontario.

MINUTES OF THE ANNUAL MEETING OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

The annual meeting of the Royal Astronomical Society of Canada was held in the McLennan Laboratory of the University of Toronto on January 17, 1939. Dr. W. Findlay presided.

The minutes of the last meeting were adopted.

The report of the General Secretary was read and approved.

The General Treasurer's report was read by Mr. Horning. The auditors drew attention to the irregular cost of the publications from year to year, which was due to certain bills having been carried over to the following year. It is planned in the future to have all accounts closed at the end of the year. It was moved by Mr. Brown and seconded by Mr. Thomson that the report be accepted as read.

It was moved by Mr. Mason and seconded by Mr. Brown that the auditors, Mr. A. R. Hassard and Mr. A. Thomson, be thanked for their work in auditing the books of the Society for 1938, and be appointed for another year.

The Librarian's report was read by Miss Budd, and accepted on the motion of Mr. Horning and Mr. Duncan.

The Curator's report was given by Mr. Duncan. It was announced that a telescope had been bequeathed to the Society by Mr. Charles Weatherbee. After this telescope has been reconditioned it will be added to those available for the members. The report was accepted.

Scrutineers were appointed to count the ballots and the results were announced by Mr. Troyer. The nominations as presented by the Council were almost unanimously approved by the 145 votes received. The President then declared the Officers and Councillors for 1939 to be the following:

Honorary President—The Hon. Leonard J. Simpson, M.D., Minister of Education for the Province of Ontario.

President—Wm. Findlay, Ph.D., Hamilton, Ont.

First Vice-President—J. A. Pearce, Ph.D., Victoria, B.C.

Second Vice-President—F. S. Hogg, Ph.D., Toronto.

General Secretary—E. J. A. Kennedy, 198 College St., Toronto.

General Treasurer—J. H. Horning, M.A., Toronto.

Recorder—R. H. Combs, Toronto.

Librarian—P. M. Millman, Ph.D., Toronto.

Curator—R. S. Duncan, Toronto.

Council—D. S. Ainslie, Ph.D., Toronto; D. W. Best, D.D., Toronto; S. C. Brown, Toronto; H. Boyd Brydon, Victoria; Miss A. V. Douglas, Ph.D., Montreal; E. A. Hodgson, Ph.D., Ottawa; Major E. H. Anundson, London, Ont.; J. A. Marsh, Hamilton; A. Thomson, M.A., Toronto; L. A. H. Warren, Ph.D., Winnipeg.

A recommendation was made to Council by Mr. Thomson that some means be explored to decrease the cost connected with the election of officers by means of ballot.

A vote of thanks to the editors of the JOURNAL and all who assisted in its publication, and to those who helped in the rearrangement of the office on College Street, was moved by Mr. Horning and seconded by Mr. Brown.

It was moved, seconded and carried, that notes of wishes for complete recovery be sent to the General Secretary, Mr. Kennedy, and to Dr. Pearce of the Dominion Astrophysical Observatory.

A vote of appreciation for the work during 1938 of the Officers and members of Council was moved by Mr. Troyer and seconded by Miss Northcott.

Dr. Findlay drew to the attention of the members that the golden jubilee of the Royal Astronomical Society of Canada occurs in 1940, the first meeting of the Society having been held February 25, 1890. In this regard Mr. Brown moved that Council consider suitable commemoration. This was seconded by Mr. Collins.

The meeting then adjourned.

RUTH J. NORTHCOTT, *for Recorder.*

REPORT OF GENERAL SECRETARY

The membership of the Society again shows a slight decrease, but this does not denote any lessening of interest in the science of astronomy, but only a stricter bookkeeping by the secretaries; though 33 joined the Society during the year in the section "Members at Large" still the list of paid-up members shows only an increase of 10.

A larger number of letters have been received by the General

Secretary this year than any previous year requesting information, purchase of Handbooks, and reprints, materials for telescope making, etc.

The JOURNAL for the year is a specially interesting volume containing the first members of a new series, communications from the David Dunlap Observatory Nos. 1, 2, and 3; for those of constructive intent "The small observatory and its design" and other informative articles.

It will be a matter of interest to the members of the Society to learn of the very wide-spread demand for the Observer's Handbook. It is an unique publication, and is a credit to the Society and the Editors who have given a great deal of thought to it. More than 2,300 copies were sold and distributed last year.

A number of members attended the meetings of the American Association for the Advancement of Science at Ottawa, in June, and took part in the papers and discussions in the astronomical section. (JOURNAL, September, 1938.)

At the triennial meeting of the International Astronomical Union, at Stockholm, Sweden, August, 1938, the Society was represented by Dr. and Mrs. J. S. Plaskett, Dr. and Mrs. Harper and Misses Evelyn and Louella Harper, Professor and Mrs. Chant, and Professor Hogg and Dr. Helen Sawyer Hogg. (JOURNAL, October, 1938.)

Vancouver, Victoria, Edmonton, Montreal and Toronto have studied astronomy by means of motion pictures at their meetings. In some centres questions and answers are found to be a good method.

A member at Guelph, which used to have an active Centre, reports a number now interested.

MEMBERSHIP OF THE SOCIETY, 1938

The Membership of the Society on December 31, 1938, as shown by the Reports of the various Centres, was as follows:

	1937	1938
Toronto	187	189
Ottawa	59	56
Victoria	126	111
Montreal	134	125

Winnipeg	45	48
London	42	41
Hamilton	44	51
Vancouver	33	32
Edmonton	43	44
Members at Large	187	197
Calgary	12	.....
Life Members not in Centres	12	14
	924	908
Additional Subscribers to JOURNAL	82	70

E. J. A. KENNEDY, *General Secretary.*

REPORT OF THE LIBRARIAN

It is very desirable that the Library of the Society is used to the fullest extent by our members and I am always glad to receive any constructive suggestions concerning ways and means by which this use may be made more general. We have recently increased the library hours at 198 College St. and for the benefit of those living in and near Toronto the new hours are listed below:

Monday and Tuesday	10-12 a.m.	2-5 p.m.
Wednesday and Friday	2- 5 p.m.	
Thursday	2- 5 p.m.	7-9 p.m.
Saturday	9-12 a.m.	

The above hours should make it possible for any member to consult the library at some time during the week. It should also be noted here that there is a table in the library available for study purposes and that brief references may be looked up on the spot without going to the trouble of taking any books out.

Members living at some distance from Toronto may borrow books from the library by mail. The only requirements under this arrangement are that the postage or express in both directions is paid by the borrower and that in general the loan should be for a period of not longer than one month. In the past outlying centres of the Society have borrowed groups of a dozen or more popular books for a period of two or three months and I am always glad to facilitate any arrangements of this nature. To give a better idea of what books are avail-

able it is planned to publish very shortly in the JOURNAL a list of the best recent books which we have in the library on various astronomical subjects.

During 1938 we received from:

Canada and the Empire	154	periodicals
The United States	200	"
Other Countries	226	"
Total	580	

The JOURNAL was sent in exchange to 145 societies and periodicals. The circulation of the Handbook is steadily increasing, particularly in the United States where it is now on sale at several points.

All monographs and the popular periodicals will be found at the Society Headquarters at 198 College St., Toronto. The technical part of the library is housed at the Dunlap Observatory, Richmond Hill. The Society would like to acknowledge with thanks the receipt of the following books:

Presented by Mr. R. H. Combs:

"The Stars in their Courses", by Sir James Jeans
"The Earth and the Stars", by C. G. Abbott
"Highlights of Astronomy", by W. Bartky
"Astronomy for Amateurs", by the staff of Popular Science Monthly

Presented by Mr. R. S. Peterson:

"The Adler Planetarium and Astronomical Museum"

Presented by Mr. J. D. Johnstone:

"Astronomy for the Benefit of Mankind", by J. D. Johnstone

Presented by bequest of Dr. Charles Weatherbee:

"First Observations in Astronomy", by Mary E. Byrd
"Elements of Astronomy", by E. Fath, 1926
"Introduction to the Study of Variable Stars", by Caroline Furness
"Laboratory Astronomy", by Willson, 1905
"The Universe of Stars", Harvard Radio Talks, 1926
"Norton's Star Atlas, 1926"

During the year the Library has secured through purchase the following monographs:

"The Nature of Variable Stars", by Paul W. Merrill, 1938
"Exploring the Heavens", by Clyde Fisher, 1937

"Unveiling the Universe", by Norton Wagner, 1936
"The Telescope", by Louis Bell, 1922
"Sundials, How to Know, Use and Make Them",
by R. N. Mayall and M. L. Mayall, 1938
"The Variable Stars", H.O. Monograph, No. V,
by C. P. Gaposchkin and S. Gaposchkin, 1938

I will be glad to learn of any recent books of general interest which the members are desirous of having added to the Library.

PETER M. MILLMAN, *Librarian*,
David Dunlap Observatory,
Richmond Hill, Ont.

REPORTS FROM THE SECRETARIES OF THE CENTRES

TORONTO CENTRE

Meetings: During the year 1 council meeting, 12 regular meetings and 1 outdoor meeting were held, with growing attendance.

January 29—Prof. E. F. Burton: The Scientific Work of Lord Rutherford.
February 8—Mr. D. A. MacRae, B.A.: Photography and the Astronomer.
February 22—Miss Ruth J. Northcott, M.A.: Percival Lowell.
March 8—Mr. S. C. Brown: Optical Parts and Care of Telescopes.
March 22—Dr. D. W. Best: How do they Know?
April 5—Dr. B. Haurwitz: The Aurora.
April 19—Prof. C. Barnes: Is the Universe Finite?
September 27—Outdoor Meeting.
October 11—By courtesy of the Director, Prof. R. K. Young, and staff, this meeting was held at the David Dunlap Observatory. Dr. Helen S. Hogg and Dr. J. F. Heard spoke briefly on the planets, Jupiter and Saturn respectively. Prof. F. S. Hogg, Dr. Heard and Dr. Millman were in charge of the telescopes where these and other objects were viewed by the exceptionally large number who attended.
October 25—Prof. C. A. Chant: A Visit to the Astronomical Congress at Stockholm.
November 8—Mr. J. R. Collins: Some Fundamental Concepts in Astronomy.
November 22—Prof. A. T. DeLury: Space.
December 6—Mr. G. H. Tidy, B.A.: Progress on the 200-inch Telescope.

In April Dr. J. F. Heard concluded his course of short lectures on the Elements of Astronomy and in October Dr. P. M. Millman began a similar popular course on the general subject "The Cosmic Yardstick" to be followed by other short lectures on particular fields

of astronomical investigation. Both these courses have proved to be of great general interest.

Membership: As of December 31, 1938:

Resident in Toronto	139
Life Members	10
Non-resident Members	46

There were 26 new members elected and 15 removed for various reasons, leaving a net gain of 11.

Observations: This Centre is working through five committees.

1. Variable stars and novae.
2. Meteors, fireballs and meteorites.
3. Sun, moon and planets.
4. Comets and asteroids.
5. Making and care of telescopes.

Any member may register with the director of the section or sections in which he is interested. The director will then plan an observation programme for him and receive monthly reports on progress.

Library: The Society's library at 198 College Street is open to members on

Monday, Tuesday—10-12 a.m. 2-5 p.m.
Wednesday—2-5 p.m.
Thursday—2-5 p.m. 7-9 p.m.
Friday—2-5 p.m.
Saturday—9-12 a.m.

The Centre is co-operating in preparation for the Spring Meeting of the A.A.V.S.O. to be held in Toronto in 1940.

D. W. Best, *Recorder.*

Ottawa Centre

Meetings: There were three open meetings of the Centre held in the lecture hall of the National Museum.

January 28—Other Galaxies, by Mr. R. Meldrum Stewart.

March 11—Atoms and Stars, by Dr. A. Vibert Douglas.

March 25—The Structure of the Earth as revealed by Seismology, by Dr. Ernest A. Hodgson.

The members and friends of the Centre were guests at an evening meeting at the Dominion Observatory on April 8. Very adverse weather conditions resulted in a small attendance.

During the last week of June, the 1938 summer meeting of the A.A.A.S. was held in Ottawa. Joint sessions of Section D and the Royal Astronomical Society of Canada were attended by members of this Centre.

Membership: At the beginning of the year the membership was 58. During the year one resigned, two were lost by death, and seven were struck off the roll for non-payment of fees. Eight new members were received, making a net loss for the year of two. Our membership at the end of the year stands at 56.

Observations: Meteor observations, both visual and photographic, were planned for the Delta Aquarid, the Perseid, and the Leonid meteors. Five of the members and a group of high school people co-operated in this programme. The summer observing periods were accompanied by adverse weather conditions, but some good results were obtained with the Leonids in November.

Correspondence: The usual notices of meetings were sent out. Some enquiries as to movie film to be used at our meetings have been made of the Corning Glass Works and the Carnegie Institute. One news letter concerning Algol, the variable star, was sent to the membership.

As in the past, and through the courtesy of the Dominion Astronomer, Mr. R. Meldrum Stewart, the Saturday Evening Programme Bulletin has been sent to all members.

MALCOLM M. THOMSON, *Secretary.*

HAMILTON CENTRE

The Centre has held its usual quota of nine regular meetings in addition to two council meetings during the year.

January 6—Mr. W. Fraser Oliver, M.A.: Einstein's Theory of Relativity.
February 3—Prof. A. B. McLay, F.R.S.C.: Cosmic Rays.
March 3—Mr. F. H. Butcher, B.A.: Greek Myths in the Heavens.
April 7—Dr. N. H. Parker: Astronomical References in the Old Testament.
May 5—Prof. R. K. Young: What We Know about the Nebulae.

June 3—Field night at the residence of Walter T. Goddard.
(See THE JOURNAL for October, page 400.)

October 6—Refreshments supplied by the wives of the executive. The feature that proved very informative and enjoyable was a quiz programme (guaranteed not to embarrass anyone) put on by W. S. Mallory and T. H. Butcher in which the members were divided into groups competing for recognition in astronomical proficiency.

November 3—Mr. T. H. Wingham, B.A.Sc.: Odds and Ends.
(Mizar, Thuban, Delta Cephei, Epsilon Aurigae, Algol, Andromeda nebula and the companion of Sirius came under review.)

December 1—Mr. W. W. Dickson, B.A.: Radio and Astronomy.

Under the presidency of George E. Campbell the first fifteen minutes after the secretarial routine is completed has changed its character from the old "curtain raiser" to prepared answers to written questions.

These questions are invited from the membership and assigned to suitable members for treatment at a subsequent meeting.

Perhaps the most elementary question asked during the year was why Orion rises on his side and sets on his feet; while the one that occasioned the most difficulty was why a planet that reduces its orbital velocity would not reduce the size of its orbit by "falling" nearer to the sun in the same given time. It took two or three meetings to straighten this matter out, as each time the question was revamped and again submitted for further treatment. This incident is mentioned as evidence of the patience of those answering the questions rather than the persistence of the members asking them. However, if both attributes are virtues this Centre is indeed blessed.

The Centre has enjoyed a prosperous year and has gone forward under the leadership of Mr. Campbell who has again been appointed to serve as its president for 1939.

The membership has increased from forty-four to fifty-one with very little membership turnover though we have been unfortunate in losing our only lady on the executive council, Mrs. Scammell having moved elsewhere.

N. H. BROADHEAD, *Secretary*.

Winnipeg Centre

The number on the roll on December 31, 1938, was forty-eight; four were elected and two resigned during the year.

One council meeting was held and seven regular meetings, when the following were the speakers:

January 12—Prof. V. W. Jackson: Meteorites; Equation of Time.

February 9—Mgr. T. W. Morton: Orbits.

March 9—Prof. L. A. H. Warren: In an Astronomer's Garden.

April 13—Members' Night, three papers were given:
Mr. L. J. Crocker: Light.
Mr. L. W. Koser: The Solar System.
Mr. R. S. Evans: Astronomical Photography.

October 12—Annual Social Evening. Mrs. J. Norris, Mr. J. H. Kolb and Mr. R. D. Colquette gave an outline of the history of this Centre from its beginning in 1909.

November 9—Prof. J. S. DeLury: The Origin of Continents and Oceans.

December 14—The President: Astronomy as a Hobby.
Annual Meeting and Election of Officers.

At several of the meetings the President gave a résumé of current events of astronomical interest.

On June 3rd the President and Mrs. Colquette were "At Home" to members, when telescopes were set up in their garden. This took the place of the regular observation night.

For the remainder of the 1938-1939 season Prof. L. A. H. Warren and Mr. C. A. E. Hensley will give a series of short talks to serve as an introduction to Astronomy for the newer members. These talks will be given immediately before the regular meetings.

Margaret E. Watterson, *Secretary.*

Victoria Centre

Membership: The membership at the last annual meeting was 126. During the year 6 members resigned and 18 were dropped because of non-payment of fees. Nine persons joined the Centre so that the present membership stands at 111. It is estimated that a further decrease of eleven, for non-payment of fees, will be necessary. The present membership is distributed as follows:

Life Members	2
Ordinary Members (local)	74
" " (out of town)	21
Junior Members	14
	111

While the membership has decreased from the previous year this has largely been caused by the dropping of members in arrears. The decrease from this cause is, however, not very significant since these persons failed to respond to personal representation and were effectively nothing but an expense to this Centre. On the other hand fewer new members were acquired this year so that we have lost ground in this respect. The policy of the Council in dropping members in arrears is a sound one and is likely to be continued. In order, therefore, that a vigorous and active Victoria Centre be maintained, it is essential that all members endeavour to interest others in the Society and its work and thus bring new members to our ranks.

Meetings: During the year twenty-two meetings were held as follows: Nine regular and one extraordinary meetings of the membership as a whole, six special meetings making up the summer course, five regular meetings of the council and one special meeting of the council and telescope-making section combined.

The meetings before the Centre as a whole have been very satisfactory, a high standard has prevailed in the lectures and symposia and the attendance, which averaged fifty persons, was excellent. The lectures have covered a wide range of subjects; the policy of securing outside authorities to lecture on branches of human activity other than astronomy has been continued with marked success. The short talks by members on "Current Phenomena" have been interesting and profitable. The Society was privileged to see two motion-picture films during the year. On May 26 a special meeting was held to see the Harvard-M.I.T. film of the 1932 solar eclipse, shown by Professor Wallace Brode of Ohio State University. A motion-picture of solar prominences, made at the McMath-Hulbert Observatory, was enjoyed at a regular meeting.

The Council meetings have been devoted to arranging programmes and generally furthering the aims and interests of the Centre. A

special meeting of the Council and Telescope-Making section took the form of a dinner in honour of Mr. Hobday, a very valuable member, who left this city for Vancouver.

Summer Course: The Summer Course this year deserves special mention because of its marked success in every respect. Attendance and registration were greater than at any previous course and the interest exhibited by visitors and members was most gratifying. The enrolment in the course was forty-five while the attendance averaged sixty-five persons. Due to the work of the course five persons became members of this Centre.

R. M. Petrie, *Secretary.*

Montreal Centre

During the session 1937-38 there were four public meetings held with speakers as follows:

November 5, 1937—Comets, Dr. A. V. Douglas.
December 14, 1937—International Co-operation in Astronomical Investigations, Mr. R. Meldrum Stewart, Dominion Observatory, Ottawa.
February 3, 1938—Five Motion Pictures, Seeing the Universe.
March 3, 1938—Research at the David Dunlap Observatory, Dr. J. F. Heard.

The Telescope Committee carried on Observational meetings on the roof of the Sun Life Assurance Co. of Canada throughout the summer and early autumn. The small but interesting library was kept available to members.

The enrolment of the Society is now 125.

A. Vibert Douglas, *Secretary.*

London Centre

During the year 1938, the London Centre held seven regular meetings with a total attendance of 221. A summary of these meetings follows:

January 18—Attendance 32.
Constellation Study directed by Mr, E. H. McKone.
Discussion of Lunar Occulations led by Dr. H. R. Kingston.
Lecture—Comets, by Dr. J. F. Heard of the staff of David Dunlap Observatory.

February 11—Attendance 23.
Constellation Study directed by Mr. E. H. McKone.
Observer's Handbook Discussion led by Dr. H. R. Kingston.
Lectures (i) Some Applications of Astronomy to Navigation, by Mr. W. L. Scandrett.
(ii) The Historical Background of Telescopes (illustrated), by President J. Higgins.

March 12—Attendance 20.
Lectures (i) Romance of the Stars, by Miss S. Livingstone.
(ii) Celestial Photography (illustrated), by Mr. O. Kilburn.

April 8—Attendance 18.
Discussion of Right Ascension and Declination, by Dr. G. R. Magee.
Lecture—Unfolding Our Galaxy, and Our Place in it, by Rev. W. G. Colgrove.

October 14—Attendance 60.
An Outside Observation, at the University of Western Ontario (perfect weather conditions prevailed).
Telescopes—manned by Mr. D. M. Henniger, Dr. H. Dowker, Dr. G. R. Magee.
Study of the Constellations—directed by Rev. W. G. Colgrove.
Refreshments (coffee and doughnuts) in the Arts Building.

November 11—Attendance 37.
An Outside Observation on the Campus of the Normal School (sky particularly clear).
Telescope—manned by Dr. H. Dowker.
Study of the Constellations—directed by Dr. H. R. Kingston, Rev. W. G. Colgrove.
Adjournment to Normal School Building for a lecture on Saturn, by Dr. H. R. Kingston.

December 9—(Annual Meeting). Attendance 31.
Business Meeting.
Entertainment—A Half Hour of Magic, by Mr. Everette Mires.

On June 4 the London Centre collaborated with the Ontario Federation of Naturalists in a regional gathering at Wonnacott's Farm, Delaware. An informal talk on Astronomy by Dr. H. R. Kingston concluded the camp-fire discussions of the gathering.

Executive Committee Meetings were held on January 18 and March 12.

Under the capable direction of Mr. J. Middlebrook the Observation Group of the London Centre observed and plotted the meagre Perseid Shower of last August.

The total membership for the year 1938 was 41.

G. R. MAGEE, *Secretary*.

Vancouver Centre

The membership of the Vancouver Centre is now 32, a decrease of one from last year.

During the year seven meetings were held, the 52nd to the 58th regular meetings of the Society. The subjects of the discussions were as follows:

January 11—Dr. William Ure: Stellar Chemistry.
February 8—Dr. A. M. Crooker: Electron Optics.
March 8—Dr. R. M. Petrie: The Origin of the Solar System.
April 12—Dr. E. O. Anderson: Stellar Diameters.
May 1—Annual Members' Dinner, at the University Cafeteria. Mr. H. W. Fowler: The Outer Planets. Reviews of the series of 1937-1938 half-hour talks by the different members responsible.
October 11—Motion Pictures: The Birth of the Earth, Hello Mars, Through the Centre of the Earth. Address of the President, Mrs. Laura Anderson, on the work of the Vancouver Centre.
November 8—Dr. A. McKellar: Astronomical Motion Pictures.
December 13—59th regular meeting (eighth annual meeting): Reports of year's activities and election of officers. Mr. C. A. McDonald: Modern Methods of Determining Time and Geographical Position.

H. W. Fowler, *Secretary.*

Edmonton Centre

There were seven regular meetings and one special meeting during the year, as well as the annual dinner meeting. The Council of the Centre met three times.

The principal speakers at the meetings were as follows:

December 9, 1937—(dinner meeting) Dean W. H. Alexander: Astrology.
January 13, 1938—Mr. D. R. Crosby: Solar and Lunar Haloes.
February 10—Three sound films: (1) The Moon, (2) The Solar System, (3) Exploring the Universe. Comments by Messrs. Campbell, Gowan and Keeping.
March 10—Miss Jean McDonald: The Earth as a Planet.
April 14—An astronomical pot-pourri, including contributions by Messrs. Wates, Simpson, Coulman, Campbell, Gowan and Keeping.
May 5—Prof. Keeping: The British Polar Year Expedition of 1932-33.
October 13—Mr. Mjolsness: The Telescope.
October 27—(special meeting) Film: Solar Prominences, with comment by Dr. Campbell.
November 10—Dr. Gowan: Variable Stars.

The annual picnic was held under ideal weather conditions on Saturday, Sept. 24, when some 15 members observed various planets and other celestial objects through Mr. Wates's 9-inch reflector.

There are 41 paid-up members and 3 associate members. These last receive the HANDBOOK but not the JOURNAL.

A few additions to the library have been made, by purchase and gift. The Centre subscribes to the popular astronomical journal "The Sky".

The officers elected for 1939 are listed on page 112.

E. S. KEEPING, *Secretary.*

FINANCIAL STATEMENTS, 1938

I. GENERAL TREASURER

GENERAL ACCOUNT No. 4359

RECEIPTS		DISBURSEMENTS	
Balance from 1937	$1,784.66	Publications	$3,403.72
($82.64 to Southam Press Fd.)		Public Meetings	61.91
Grants received	2,270.00	Library	26.62
Fees	1,635.45	Interest and Discount	35.19
Publications	671.74	Stamps and Stationery	330.88
Interest	139.67	Salary, Asst. Sec.-Treas.	660.00
		Grants to Centres	625.50
		Rent	120.00
		Janitor	18.00
		Miscellaneous	51.00
		Balance to 1939	1,168.70
Totals	$6,501.52		$6,501.52

BANK RECAPITULATION

ACCOUNT No. 4359

Balance—31-12-1938	$1,832.80
Cheques outstanding	
1—$ 10.00	
2— 243.70	
3— 410.40	664.10
Net Balance to 1939	$1,168.70

($157.97 belongs to Southam Press Fund)

LIFE MEMBERS' ACCOUNT No. 4390

Receipts		Disbursements	
Balance from 1937	$118.62	Nil	$ 0.00
2 Life Members' Fees	50.00		
Bank Interest	.68	Balance to 1939	169.30
Totals	$169.30		$169.30

BUILDING FUND ACCOUNT No. 4383

Receipts		Disbursements	
Balance from 1937	$300.76	Nil	$ 0.00
Bond Interest	192.50		
Bank Interest	1.59	Balance to 1939	494.85
Totals	$494.85		$494.85

SOUTHAM PRESS FUND

(Deposited in the General Account)

Receipts		Disbursements	
Balance from 1937	$ 82.64	Nil	$ 0.00
Bond Interest	74.50		
Bank Interest	.83	Balance to 1939	157.97
Totals	$157.97		$157.97

Audited and found correct, January 16, 1939.

ANDREW THOMSON }
A. R. HASSARD } *Auditors.*

J. H. HORNING, *General Treasurer.*

II. TREASURERS' REPORTS OF CENTRES

TORONTO CENTRE

Receipts		Disbursements	
Balance from previous year..	$133.60	Rental	$ 39.00
Members' Fees	314.00	Fees forwarded to Gen. Tr.	314.00
Grant from Gen. Council	157.00	Postage and Stationery	1.00
Bank Interest	.....	Expenses re Meetings	126.91
		Printing	.....
		Exchange on Cheques	.....
		Miscellaneous	.....
		Balance carried forward	123.69
Totals	$604.60		$604.60

OTTAWA CENTRE

Receipts		Disbursements	
Balance from previous year..	$157.21	Rental	$ 0.00
Members' Fees (39)	99.00	Fees forwarded to Gen. Tr.	155.00
Grant from Gen. Council	77.50	Postage and Stationery	3.00
Bank Interest	.30	Expenses re Meetings	78.45
		Printing	.....
		Exchange on Cheques	.....
		Miscellaneous	.....
		Balance carried forward	97.56
Totals	$334.01		$334.01

HAMILTON CENTRE

Receipts		Disbursements	
Balance from previous year..	$ 16.86	Rental	$ 18.00
Members' Fees	72.00	Fees forwarded to Gen. Tr.	98.00
Grant from Gen. Council	46.00	Postage and Stationery	10.38
Bank Interest	.23	Expenses re Meetings	8.75
Proceeds Field Night	22.80	Printing	10.00
Donation	.50	Exchange on Cheques	.....
		Miscellaneous	11.74
		Balance carried forward	1.52
Totals	$158.39		$158.39

WINNIPEG CENTRE

Receipts		Disbursements	
Balance from previous year..	$ 13.52	Rental	$ 7.00
Members' Fees	72.53	Fees forwarded to Gen. Tr.	72.50
Grant from Gen. Council	36.00	Postage and Stationery	8.38
Bank Interest	.36	Expenses re Meetings	10.60
		Printing	.....
		Exchange on Cheques	.....
		Miscellaneous	.....
		Balance carried forward	23.93
Totals	$122.41		$122.41

VICTORIA CENTRE

Receipts		Disbursements	
Balance from previous year ..	$ 27.48	Rental	$ 22.50
Members' Fees	174.00	Fees forwarded to Gen. Tr.	178.00
Grant from Gen. Council	84.00	Postage and Stationery	25.49
Bank Interest	.40	Expenses re Meetings	7.31
Balance Summer Course	22.71	Printing	23.64
Miscellaneous	.71	Exchange on Cheques	.25
		Miscellaneous	7.53
		Advertising	13.42
		Balance carried forward	31.16
Totals	$309.30		$309.30

MONTREAL CENTRE

Receipts		Disbursements	
Balance from previous year..	$184.36	Rental	$ 0.00
Members' Fees	177.00	Fees forwarded to Gen. Tr.	177.00
Grant from Gen. Council	113.00	Postage and Stationery	10.88
Bank Interest	4.35	Expenses re Meetings	76.30
		Printing	.....
		Exchange on Cheques	.....
		Miscellaneous	7.40
		Library Expenses	6.80
		Balance carried forward	200.33
Totals	$478.71		$478.71

LONDON CENTRE

Receipts		Disbursements	
Balance from previous year..	$139.94	Rental	$ 0.00
Members' Fees	92.00	Fees forwarded to Gen. Tr.	166.00
Grant from Gen. Council	39.00	Postage and Stationery	8.68
Bank Interest	.67	Expenses re Meetings	21.31
		Printing	.....
		Exchange on Cheques	.....
		Miscellaneous	17.74
		Balance carried forward	57.88
Totals	$271.61		$271.61

VANCOUVER CENTRE

Receipts		Disbursements	
Balance from previous year..	$ 0.69	Rental	$ 0.00
Members' Fees	47.00	Fees forwarded to Gen. Tr.	47.00
Grant from Gen. Council	32.00	Postage and Stationery	16.89
Bank Interest	.30	Expenses re Meetings	20.55
Deficit	4.45	Printing	.....
		Exchange on Cheques	.....
		Miscellaneous	.....
		Balance carried forward	.....
Totals	$ 84.44		$ 84.44

EDMONTON CENTRE

Receipts		Disbursements	
Balance from previous year..	$ 51.66	Rental	$ 0.00
Members' Fees	96.50	Fees forwarded to Gen. Tr.	99.80
Grant from Gen. Council	41.50	Postage and Stationery	10.40
Bank Interest	1.89	Expenses re Meetings	31.90
Miscellaneous	1.25	Printing	21.88
		Exchange on Cheques	.15
		Miscellaneous	1.50
		Balance carried forward	27.17
Totals	$192.80		$192.80

OFFICERS FOR 1939

Honorary President—The Hon. Leonard J. Simpson, M.D., Minister of Education for the Province of Ontario.
President—Wm. Findlay, M.A., Ph.D., Hamilton, Ont.
First Vice-President—J. A. Pearce, M.A., Ph.D., Victoria, B.C.
Second Vice-President—F. S. Hogg, M.A., Ph.D., Toronto.
General Secretary—E. J. A. Kennedy, 198 College St., Toronto.
General Treasurer—J. H. Horning, M.A., Toronto.
Recorder—R. H. Combs, Toronto.
Curator—R. S. Duncan, Toronto.
Librarian—P. M. Millman, M.A., Ph.D., Toronto.
Council—D. S. Ainslie, M.A., Ph.D., Toronto; D. W. Best, D.D., Toronto; S. C. Brown, Toronto; H. Boyd Brydon, Victoria; Miss A. V. Douglas, Ph.D., Montreal; E. A. Hodgson, M.A., Ph.D.; Major E. H. Anundson, London, Ont.; J. A. Marsh, M.P., Hamilton, Ont.; A. Thomson, M.A., Toronto; L. A. H. Warren, M.A., Ph.D.; and Past

Presidents—Sir Frederick Stupart; C. A. Chant, M.A., Ph.D., LL.D.; A. T. DeLury, M.A.; J. S. Plaskett, D.Sc., F.R.S.; A. F. Miller; J. R. Collins; W. E. W. Jackson, M.A.; R. M. Stewart, M.A.; A. F. Hunter, M.A.; W. E. Harper, M.A., D.Sc.; H. R. Kingston, M.A., Ph.D.; R. K. Young, Ph.D.; L. Gilchrist, M.A., Ph.D.; R. E. DeLury, M.A., Ph.D., and the presiding officer of each Centre.

TORONTO CENTRE

Honorary Chairman—Dr. C. A. Chant
Chairman—S. C. Brown
Vice-Chairman—Dr. D. W. Best
Secretary—F. L. Harvey, 80 Gates Ave.
Recorder—Miss R. J. Northcott, M.A.
Treasurer—T. H. Mason
Curator—R. S. Duncan
Council—Dr. D. S. Ainslie; Dr. L. Gilchrist; Dr. J. F. Heard; Dr. F. S. Hogg; J. H. Horning; Dr. P. M. Millman; Rev. C. H. Shortt; T. O. Waring; Dr. R. K. Young; and Past Chairmen—A. F. Miller; A. F. Hunter; J. R. Collins; A. R. Hassard; and E. J. A. Kennedy

OTTAWA CENTRE

Honorary President—John McLeish, B.A.
President—Miss M. S. Burland, B.A.
First Vice-President—F. W. Matley
Second Vice-President—Dr. T. L. Tanton
Secretary—Malcolm M. Thomson, Dominion Observatory
Treasurer—A. C. Steedman
Council—Hoyes Lloyd; R. G. Madill; W. W. Nichol; C. B. Reilly, K.C.; D. B. Nugent; and Past President A. H. Miller

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President—Geo. E. Campbell
First Vice-President—T. H. Wingham
Second Vice-President—W. T. Goddard
Third Vice-President—W. S. Mallory
Secretary-Treasurer—H. Fox, Jr., 257 Balmoral Avenue N.
Curator—T. H. Wingham
Council—Dr. Wm. Findlay; Dr. A. E. Johns; J. A. Marsh, M.P.; Rev. E. F. Maunsell; N. H. Broadhead; E. G. Freeman; J. S. Taylor; E. E. Bossence; F. H. Butcher

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President—R. D. Colquette
First Vice-President—L. J. Crocker
Second Vice-President—G. P. Morse
Treasurer—R. S. Evans, 10 Ruskin Row
Secretary—Miss Margaret E. Watterson, 909 Boyd Building
Council—Miss O. A. Armstrong; W. R. Junkin; L. W. Koser; C. A. E. Hensley; L. McAllister; Mrs. J. Norris; Dr. L. A. H. Warren

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President—Robert Peters
First Vice-President—R. M. Petrie, Ph.D.
Second Vice-President—Capt. Wm. Everall
Secretary-Treasurer—Andrew McKellar, Ph.D., Dominion Astrophysical Observatory
Recorder—Miss P. Riddle, B.A.
Librarian—Miss C. Hailstone
Council—L. Hopkins; R. Hopkins; Miss Langworthy; O. M. Prentice; J. Smith; W. A. Thorne; K. O. Wright, B.A.

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President—E. Russell Paterson
First Vice-President—F. de Kinder
Second Vice-President—Julian C. Smith
Secretary-Treasurer—A. Vibert Douglas, Ph.D., McGill University
Librarian—F. de Kinder
Council—A. Norman Shaw; W. E. Lyman; G. Harper Hall; G. R. Lighthall; O. A. Ferrier; H. F. Hall; J. Addison Reid; C. C. Birchard

LONDON CENTRE

Honorary President—Dr. H. R. Kingston
President—Rev. W. G. Colgrove
Vice-President—T. C. Benson
Secretary-Treasurer—Dr. G. R. Magee, 427 William St.
Council—O. Kilburn; D. M. Hennigar; Miss S. Livingstone; W. L. Scandrett; J. Middlebrook; and Past President J. C. Higgens

VANCOUVER CENTRE

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President—Mr. C. A. McDonald
First Vice-President—Mr. C. E. Bastin
Second Vice-President—Mr. D. L. Shaw, B.Sc., M.S.
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METEOR NEWS

Observations relating to meteors and meteorites are cordially invited.

Orionid Observations made in Bologna, 1938

Particularly unfavourable weather conditions were encountered in Ontario at the time of the autumn meteor showers. However, M. Eppe Loreta, of Bologna, Italy, a very active member of our society, secured a good run of visual observations of the Orionid meteors. In reporting these he makes an interesting comparison between his Orionid observations of 1936 (see this Journal, vol. 30, p. 416, 1936), and those of 1938. Observations were made on six nights in 1936 and on seven nights in 1938. The results for these two years are summarized at the top of Figure 1, where the mean hourly rate from 11.30 p.m. to 1.30 a.m. G.C.T. for a single observer in Bologna has been plotted against the heliocentric longitude of the earth. On a few nights where actual observations were not carried out during the whole of the above period the corresponding mean rate could be closely estimated from observations made at other times of the night. Plotting the rates against heliocentric longitude rather than date removes the irregularity introduced by leap year. M. Loreta's observations seem to indicate clearly an Orionid maximum near longitude 28°.5 corresponding to an average date Oct. 22. This is two days later than the date usually given for the Orionid maximum and Loreta's rates are also considerably higher than those usually reported.

The mean magnitude of the 247 Orionids observed in 1938 was 2.97 and for the 181 non-Orionids was 3.21. The 1936 mean magnitudes correspond closely, being 2.94 for the Orionids and 3.33 for the non-Orionids. The two sets of observations compared in the Figure are of considerable interest because they were made by an experienced meteor observer and are homogeneous in all respects.

A particular effort was made, during these observations, to note the drift of any enduring trains. Only one meteor, a non-Orionid, had a train which remained visible longer than 5 sec. This was of magnitude 1 and appeared at 0^h50^m Oct. 22, 1938. The train remained visible for 10 sec. to the naked eye and could be observed for 30 sec. in binoculars of aperture 1.8 inches. During this interval

it drifted slightly towards the south-east, as shown in the plot in the lower part of Figure 1.

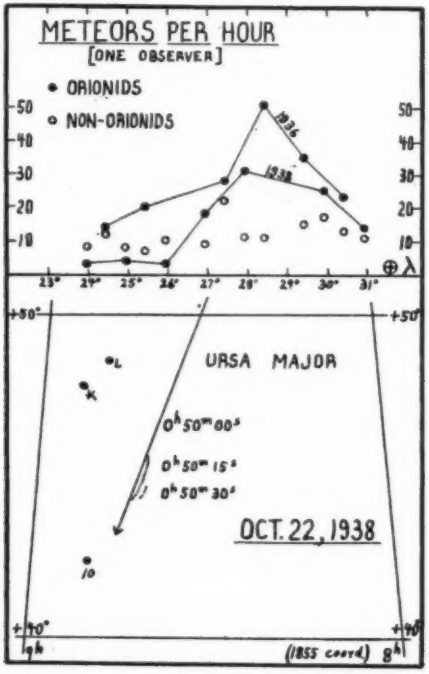


Fig. 1.—*Above*—Meteor rates observed by Eppe Loreta in Bologna. Rates are plotted against heliocentric longitude of the earth. *Below*—Bright fireball observed in Bologna at 0h 50m G.C.T., Oct. 22, 1938. Path started at α 7h 40m, δ +66°. Train drift plotted with binoculars.

A recent communication from M. Loreta states that he encountered impossible observing conditions during the Leonid and Geminid showers of 1938 and had only 35 minutes of clear weather during the Quadrantid shower, when he observed 9 meteors in the period 4.10-4.45 a.m. G.C.T., Jan. 1, 1939. Three of these were probably Quadrantids and three seemed to radiate from Virgo, confirming a radiant observed the year before.

P. M. M.

NOTES AND QUERIES

Communications are invited, especially from amateurs. The Editor will try to secure answers to queries.

Toronto Centre Variable Star and Nova Programme 1938 Observations

Four members of this observing section submitted observations during 1938, and are to be commended for their work. In searching for novae Mr. McNabb made 159 observations of 9 areas, while Mr. Topham made 33 observations of 4 areas. The largest number of variable star observations was made by Mr. Forster, although Mr. Topham followed the largest number of different variable stars. A summary of the observations is given in the following table.

Elaborate equipment is not necessary for this work. Areas can be watched for novae with the naked eye or with binoculars; the brighter variable stars can be observed with binoculars or small telescopes. Anyone interested in making observations such as these will be supplied with information and charts from the director of the section. It is hoped that with the coming of more comfort-

REPORT OF NOVA SEARCH OBSERVATIONS DURING 1938

Mr. Neil McNabb

Month	Area	Faintest Magnitude Visible				Total Nights	Month	Area	Faintest Magnitude Visible				Total Nights
		8	7	6	5				8	7	6	5	
Jan.	8	..	3	2	..	5	Apr.	36	..	1	3	1	5
	72	..	2	1	..	3		37	..	1	3	1	5
Feb.	8	..	5	3	..	8		38	..	1	3	1	5
	36	..	..	8	..	8		58	1	1	2	1	5
	37	..	..	8	..	8		72	..	2	4	..	6
	38	..	..	8	..	8	July	8	..	1	..	..	1
	58	..	2	1	..	3		58	..	1	..	..	1
	72	2	4	3	1	10		77	..	..	1	..	1
Mar.	8	..	5	5	..	10		78	..	..	1	..	1
	36	..	5	7	..	12		86	..	..	1	..	1
	37	..	5	7	..	12	Jun.	8	..	1	..	..	1
	38	..	5	7	..	12		58	1	..	1	..	2
	58	1	4	4	1	10		77	..	..	2	..	2
	72	6	3	3	..	12		78	..	..	2	..	2

MR. BERT TOPHAM

Apr.	65	1	..	..	..	1	Jun.	75	3	..	1	..	4
	75	1	..	..	..	1	Aug.	16	1	..	..	..	1
	91	2	..	..	..	2		65	2	..	..	..	2
May	16	1	..	..	..	1		75	2	..	..	..	2
	65	1	..	..	..	1	Oct.	16	..	..	4	..	4
	75	1	..	..	..	1		65	2	1	..	..	3
Jun.	16	3	..	..	..	3		75	2	1	..	..	3
	65	3	..	1	..	4							

REPORT OF VARIABLE STAR OBSERVATIONS DURING 1938

Observer	Instrument	Number of Variables	Number of Observations
Neil McNabb	2″-6″	4	51
Bert Topham	6″	38	64
C. N. Forster	6″	12	88
R. S. Peterson	3″	1	7

able observing weather more of the members registered in this section will find it possible to make regular observations.

David Dunlap Observatory,
Richmond Hill, Ontario. RUTH J. NORTHCOTT.

THE 82-INCH MIRROR OF THE MCDONALD OBSERVATORY

In the Astrophysical Journal for January, 1939, Dr. J. S. Plaskett reports the completion of the figuring and testing of the 82-inch McDonald mirror. The work was carried on in the optical shops of the Warner and Swasey Company, of Cleveland, Ohio, under the direction of Mr. C. A. R. Lundin. In 1936 Dr. Plaskett was appointed as consultant to the company, and as such has played an important part in supervising the completion of this mirror.

The final quantitative tests of the mirror are described, and the conclusion is reached that the surface is free from astigmatism, and that the Hartmann criterion, T, is a great deal smaller (indicating a more nearly ideal surface) than that for any of the other large mirrors for which quantitative tests are known.

Astronomers will rejoice that the troublesome job of finishing this important telescope has reached such a triumphant conclusion. The combination of the Pyrex disc (such as has proved so satisfactory even under the extreme temperature ranges which we have had here at Richmond Hill), of the apparently superb figure of the mirror, the advanced mechanical design of the telescope, and the climatically satisfactory Texas mountain site, should permit the McDonald telescope to make unique contributions to observational astronomy. The McDonald Observatory is operated by the University of Texas and the University of Chicago, under the direction of Professor Otto Struve, Director of the Yerkes Observatory.

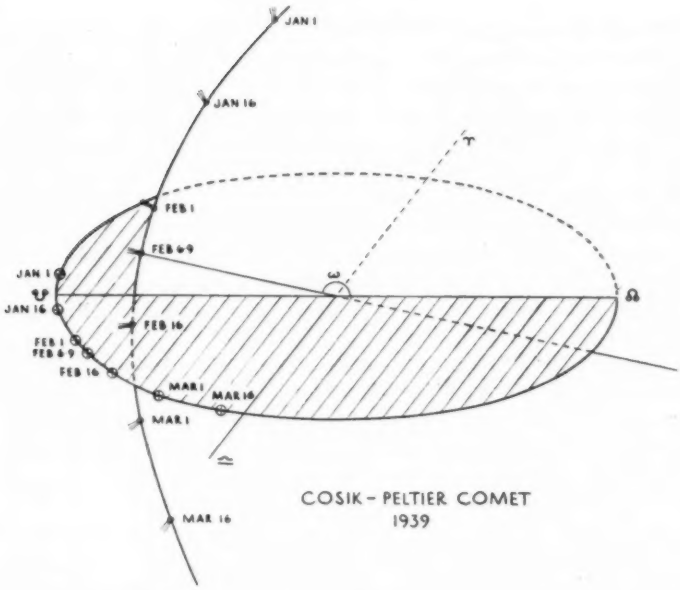
Canadians will of course be pleased that Dr. Plaskett's ability and experience in optical work has been recognized by his appointment as consultant to the Warner and Swasey Company, and that his supervision of the work on the 82-inch has contributed to such a satisfactory mirror.

The Society for Research on Meteorites

Dr. Frederick C. Leonard, of the University of California, has notified us that the Society for Research on Meteorites has been admitted as an affiliated society by the American Association for Advancement of Science. This society was founded in 1933, and has, through its meetings and its publications in Popular Astronomy, created considerable interest in the location, collection and study of meteorites. The society's prestige will be enhanced by this advance from "associated society" to "affiliated society" of the A.A.A.S. Dr. Leonard was one of the organizers and first president of the Society for Research on Meteorites.

Comet Cosik-Peltier

New elements of this comet, determined from longer arcs than that published in the February Journal, have been determined at several observatories (Harvard Announcement Cards 471, 472). These elements are more accurate, but in substantial agreement with the earlier determinations.



The above diagram represents the orbit of the comet relative to that of the earth. The comet's orbit is in the plane of the paper. Perihelion February 6, 9, 1939.

The comet is now well past perihelion, and is also too far south to be observable from Canadian stations. Its ephemeris is as follows:

		R.A. (1939)			Dec.		from Earth	from Sun	Mag.
		h	m	s					
Mar.	10	3	12	01	−33°	45'.1	0.843	0.945	9.2
	14	3	26	59		35 15.2	0.906	0.995	9.7
	18	3	40	46		37 19.8	0.969	1.048	
	22	3	53	41		39 04.7	1.031	1.102	
	26	4	05	58		40 34.4	1.091	1.157	
	30	4	17	51		41 52.4	1.150	1.214	
Apr.	3	4	29	27		43 01.1	1.207	1.270	

Members of our Society will be interested to learn that one of our own members, from Birmingham, Alabama, independently discovered this comet some days after it had been discovered by Cosik and by Peltier. F. S. H.

An Important Meteorological Meeting

A joint meeting of the Royal Meteorological Society and the American Meteorological Society will be held on August 28th and 29th, 1939, at the Meteorological Office, Toronto. This is the first meeting of the Royal Meteorological Society to be held outside of Great Britain, and a good representation of meteorologists from Norway and the United States is expected, as well as those from Great Britain and Canada. In view of the short time of the meeting, discussion will be limited mainly to radiation and the extratropical cyclone.

Andrew Thomson.

In Florida Again

One of the questions asked by the visitor from the frozen north when he sees the multitudes gathered to enjoy the warmth and sunshine in the numerous centres in Florida is, How did they all get there? And on viewing the cars from every state and province closely ranged along miles of streets, where the one-hour parking limit frequently contains a hundred minutes or more, the conclusion is that the invaders came by automobile. The railways, however, day after day deliver long train-loads. My attention was drawn specially to a recently established north-south day-coach train, described in a modest folder as "streamlined in its shining sheathing of stainless steel with silent, smooth diesel-electric power". An arresting feature is its name "Silver Meteor", illustrated by a comet with a curving tail and stellar nucleus. I suppose a comet is a sort of meteor. In this case the comet returns. Its period is six days and one almost needs a printed ephemeris to observe it. Of course the airplane is sometimes used, especially by those who think they cannot live unless they are in a hurry. Such is life!

It is hard to realize what season it is in the sub-tropical regions. There is a profusion of palms and flowers, and the newcomer wonders what will happen to them when the frost comes! But the frost does not come, it is winter now! It is confusing, however, to see different trees, sometimes of the same species, in different stages of their yearly cycle,—some devoid of foliage, some putting forth leaves and flowers

and some in fruit. The citrus trees are wonderful examples. On the same trees we find sweet white blossoms, golden fruit and glossy green leaves.

I was interested to read the following remarks on this subject by a well-known writer who has lived near Miami for many years:

> So equable are climatic conditions here that a stranger, no matter how well educated or how complete his knowledge, would only be able to guess at the season by the altitude of the sun. Put the most accomplished northern botanist into one of our hammocks and I defy him to tell whether it is June or January, spring or autumn.
>
> In fact the all-year resident of the more tropical part of the state becomes bewildered and has to stop and make calculations in order that he may get his bearings. When the tourists come he knows that the winter is at hand; when they go north it is spring, and that is really the most satisfactory almanac he has.—*Florida Wild Life* by C. T. Simpson, p. 182. (N.Y., 1932.)

Perhaps the wandering astronomer may be excused when in the balmy evening he looks up overhead for Vega and mistakes Procyon for it.

C. A. C.

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